

Table 1: Cohort Demographics

	Complete Cohort Demographics						Disease Severity Amongst Patients Hospitalized for COVID-19				Patient Outcome					
	Uninfected		Infected				Moderate		Severe		All		Alive		Deceased	
	Healthcare Workers	Not Hospitalized for COVID-19	Moderate Disease	Severe Disease	Fatal COVID-19	Total Cohort	Moderate	Severe	All	Alive	Deceased	All	All	All	All	
Summary	N (% Total) 109 (38.79%)	N (% Total) 26 (9.25%)	N (% Total) 81 (28.83%)	N (% Total) 42 (14.95%)	N (% Total) 23 (8.19%)	N (% Total) 281 (100%)	N (% Total) 84 (57.53%)	N (% Total) 62 (42.47%)	N (% Total) 146 (100%)	N (% Total) 131 (85.06%)	N (% Total) 23 (14.94%)	N (% Total) 154 (100%)	N (% Total) 154 (100%)			
Age	Mean, Std Dev 37.39, ±11.7	Mean, Std Dev 37.31, ±14.24	Mean, Std Dev 63.32, ±15.99	Mean, Std Dev 64.57, ±14.47	Mean, Std Dev 71.09, ±18.34	Mean, Std Dev 51.68, ±19.87	Mean, Std Dev 64.12, ±16.40	Mean, Std Dev 65.89, ±15.7	Mean, Std Dev 64.9, ±16.09	Mean, Std Dev 62, ±16.68	Mean, Std Dev 71.09, ±18.34	Mean, Std Dev 63.36, ±17.18				
Age Group	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	Relative Risk (95% CI), p-value*	N (%)	N (%)	Relative Risk (95% CI), p-value*	N (%)			
<59	105 (96.33%)	22 (84.62%)	30 (37.04%)	12 (28.57%)	4 (17.39%)	173 (61.57%)	30 (35.71%)	16 (25.81%)	0.67 (0.39-1.15)	46 (31.51%)	50 (38.17%)	0.48 (0.19-1.19)	54 (35.06%)			
59-74	4 (3.67%)	4 (15.38%)	28 (34.57%)	17 (40.48%)	7 (30.43%)	60 (21.35%)	28 (33.33%)	24 (38.71%)	1.27 (0.61-1.99)	52 (35.62%)	45 (34.35%)	0.8 (0.39-1.65)	52 (33.77%)			
>74	0 (0%)	0 (0%)	23 (28.4%)	13 (30.95%)	12 (52.17%)	48 (17.08%)	26 (30.95%)	22 (35.48%)	1.11 (0.69-1.78)	48 (32.88%)	36 (27.48%)	1.96 (1.22-3.15)	48 (31.17%)			
Sex																
F	83 (76.15%)	22 (84.62%)	39 (48.15%)	21 (50%)	8 (34.78%)	173 (61.57%)	41 (48.81%)	27 (43.55%)	0.80 (0.56-1.16)	68 (46.58%)	66 (50.38%)	0.73 (0.41-1.3)	74 (48.05%)			
M	26 (23.85%)	4 (15.38%)	42 (51.85%)	21 (50%)	15 (65.22%)	108 (38.43%)	43 (51.19%)	35 (56.45%)	.86 (0.83-1.53)	78 (53.42%)	65 (49.62%)	1.27 (0.89-1.83)	80 (51.95%)			
Race or Ethnicity																
American Indian/ Alaskan native	0 (0%)								—			—				
Asian	7 (6.42%)	1 (3.85%)	1 (1.08%)	0 (0%)	1 (4.35%)	10 (3.56%)	0 (0%)	3 (4.84%)	—	2 (1.37%)	1 (0.76%)	1 (4.35%)	2 (1.3%)			
Black/African American [Not Hispanic/Latin(a/o)]	6 (5.5%)	3 (11.54%)	24 (29.63%)	15 (50%)	7 (30.43%)	60 (21.35%)	26 (30.95%)	25 (40.32%)	1.33 (0.86-2.06)	51 (34.93%)	46 (35.11%)	0.87 (0.45-1.68)	53 (34.42%)			
Native Hawaiian/ Pacific Islander	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	—	0 (0%)	0 (0%)	—	0 (0%)			
White/Caucasian [Not Hispanic/Latin(a/o)]	82 (75.23%)	18 (69.23%)	42 (51.85%)	11 (36.67%)	11 (47.83%)	168 (59.79%)	43 (51.19%)	24 (38.71%)	0.80 (0.56-1.16)	68 (46.58%)	59 (45.04%)	1.09 (0.69-1.72)	70 (45.45%)			
Hispanic/Latin(a/o) of any race	8 (7.34%)	4 (15.38%)	13 (16.05%)	4 (13.33%)	4 (17.39%)	34 (12.10%)	13 (15.48%)	9 (14.52%)	1.00 (0.46-2.17)	22 (15.07%)	22 (16.79%)	1.04 (0.4-2.73)	26 (16.88%)			
Multiple	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	—	0 (0%)	0 (0%)	—	0 (0%)			
Unknown	6 (5.5%)	0 (0%)	2 (2.47%)	0 (0%)	0 (0%)	9 (3.20%)	2 (2.38%)	1 (1.61%)	—	3 (2.05%)	3 (2.29%)	—	3 (1.95%)			
HCW/Patient Breakdown																
HCW	109 (100%)	18 (69.23%)	0 (0%)	0 (0%)	0 (0%)	127 (45.20%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)				
Patient	0 (0%)	8 (30.77%)	81 (100%)	42 (100%)	23 (100%)	154 (54.80%)	84 (100%)	62 (100%)	146 (100%)	131 (100%)	23 (100%)	154 (100%)				
Mortality																
Severity							3 (3.57%)	20 (32.26%)	8.72 (2.70-28.16), <.0001							
MODERATE											5 (21.74%)	0.29 (0.13-0.63), .001				
SEVERE											18 (78.26%)	3.21 (2.2-4.68), .0003				
Health Risk Factors Amongst Patients																
Cancer within 1 year	0 (0%)	0 (0%)	11 (13.58%)	4 (9.52%)	5 (21.74%)	20 (12.99%)	12 (14.29%)	8 (12.9%)	0.92 (0.40-2.11)	20 (13.7%)	15 (11.45%)	2.05 (0.82-5.11)	20 (12.99%)			
Chronic Heart Disease (CHD)	2 (25%)	2 (25%)	24 (29.63%)	18 (42.86%)	12 (52.17%)	56 (36.36%)	25 (29.76%)	29 (46.77%)	1.54 (1.01-2.36)	54 (36.99%)	44 (33.59%)	1.5 (0.92-2.44)	56 (36.36%)			
Hypertension (HTN)	2 (25%)	2 (25%)	46 (56.79%)	31 (73.81%)	20 (86.96%)	99 (64.29%)	48 (57.14%)	49 (79.03%)	1.38 (1.10-1.73)	97 (66.44%)	79 (60.31%)	1.45 (1.16-1.81)	99 (64.29%)			
Chronic Lung Disease	1 (12.5%)	1 (12.5%)	25 (30.86%)	17 (40.48%)	9 (39.13%)	52 (33.77%)	25 (29.76%)	26 (41.94%)	1.38 (0.88-2.15)	51 (34.93%)	43 (32.82%)	1.09 (0.6-2.0)	52 (33.77%)			
Immunosuppression*	1 (12.5%)	1 (12.5%)	43 (53.09%)	25 (59.52%)	17 (73.91%)	86 (55.84%)	45 (53.57%)	40 (64.52%)	1.19 (0.91-1.57)	85 (58.22%)	69 (52.67%)	1.39 (1.02-1.88)	86 (55.84%)			
COVID-19 HEALTH RISK FACTORS SUM																
0	2 (25%)	2 (25%)	17 (20.99%)	3 (7.14%)	0 (0%)	22 (14.29%)	17 (20.24%)	3 (4.84%)	0.24 (0.07-0.79), .0089	20 (13.7%)	22 (16.79%)	0 (0-0)	22 (14.29%)			
1	6 (75%)	6 (75%)	17 (20.99%)	10 (23.81%)	4 (17.39%)	37 (24.03%)	18 (21.43%)	13 (20.97%)	0.99 (0.53-1.87)	31 (21.23%)	33 (25.19%)	0.74 (0.29-1.89)	37 (24.03%)			
2	0 (0%)	0 (0%)	21 (25.93%)	12 (28.57%)	5 (21.74%)	38 (24.68%)	22 (26.19%)	16 (25.81%)	1.00 (0.58-1.74)	38 (26.03%)	33 (25.19%)	0.89 (0.39-2.05)	38 (24.68%)			
3	0 (0%)	0 (0%)	17 (20.99%)	8 (19.05%)	7 (30.43%)	32 (20.78%)	18 (21.43%)	14 (22.58%)	1.07 (0.58-1.98)	32 (21.92%)	25 (19.08%)	1.67 (0.82-3.4)	32 (20.78%)			
4+	0 (0%)	0 (0%)	9 (11.11%)	9 (21.43%)	7 (30.43%)	25 (16.23%)	9 (10.71%)	16 (25.81%)	2.30 (1.08-4.90), .0442	25 (17.12%)	18 (13.74%)	2.02 (0.9-4.56)	25 (16.23%)			

Table 2: Logistic Regression Reports

Disease Severity	Predictor	Odds Ratio			p value	AUC
		(per unit)	Lower 95%	Upper 95%		
Disease Severity	Saliva Viral Load	1.58	1.17	2.13	0.0012	0.71
	NP Viral Load	1.01	0.80	1.28	ns	0.51
	Age	1.00	0.98	1.02	ns	0.51
	Days from Symptom Onset	1.03	0.98	1.09	ns	0.58
With Days from Symptom Onset						
Saliva Viral Load and Days from Symptom Onset						
	Saliva Viral Load	2.03	1.36	3.03	<.0001*	0.79
	Days from Symptom Onset	1.11	1.03	1.20	0.0021*	
NP Viral Load and Days from Symptom Onset						
	NP Viral Load	1.17	0.89	1.54	ns	0.68
	Days from Symptom Onset	1.10	1.03	1.18	0.0036*	
Mortality						
Mortality	Saliva Viral Load	2.21	1.35	3.60	0.0001*	0.83
	NP Viral Load	1.23	0.92	1.64	ns	0.58
	Age	1.03	1.00	1.07	0.0376*	0.63
	Days from Symptom Onset	1.02	0.96	1.09	ns	0.55
With Days from Symptom Onset						
Saliva Viral Load and Days from Symptom Onset						
	Saliva Viral Load	3.69	1.69	8.04	<.0001*	0.90
	Days from Symptom Onset	1.18	1.05	1.33	0.0011*	
NP Viral Load and Days from Symptom Onset						
	NP Viral Load	1.40	1.00	1.95	0.0452*	0.67
	Days from Symptom Onset	1.08	1.00	1.16	0.0560	
Full Spectrum of Disease						
Likelihood Ratio						
Saliva Viral Load and Days from Symptom Onset						
	Saliva Viral Load	40.12			<.0001*	
	Saliva Viral Load	39.04			<.0001*	
	Days from Symptom Onset	67.78			<.0001*	
	Saliva Viral Load * Days from Symptom Onset	9.96			0.0016	
	Non-Hospitalized					—
	Moderate					0.96
	Severe					0.89
	Fatal					0.91
NP Viral Load and Days from Symptom Onset						
	NP Viral Load	7.69			0.0015	
	NP Viral Load	4.65			0.0311	
	Days from Symptom Onset	14.90			0.0001	
	NP Viral Load * Days from Symptom Onset	1.12			ns	
	Non-Hospitalized					—
	Moderate					0.75
	Severe					0.66
	Fatal					0.67

Extended Table 3

Term	Least Squares Mean Difference, (95% CI) p value			Least Squares Mean Difference, (95% CI) p value			RESTRICTED MAXIMUM LIKLIHOOD				RESTRICTED MAXIMUM LIKLIHOOD				
	Saliva Viral Load	NP Viral Load		Saliva Viral Load	NP Viral Load		Estimate	R adjusted	RMSE	p value	Estimate	R adjusted	RMSE	p value	
T cells	**			*											
Age		0.0076	0.0047	Saliva Viral Load	0.0076, (-0.0047)	0.0021	0.957	0.162	0.0024	0.0021	NP Viral Load	-0.035, (-0.061--0.008)	0.96	0.121	0.0361
Viral Load Levels		0.0007	0.0012	Days from Symptom Onset	0.0007, (-0.0012)	0.0184				0.0184	Days from Symptom Onset	-0.002, (-0.009-0.005)			0.512
HCW vs High	1.3 (0.7-1.91)	<0.001	0.0004												
Low vs High	0.89 (0.34-1.43)	0.0015	0.440												
Med vs High	0.61 (-0.1-1.23)	0.052	0.943												
CD8 T cells							0.964	0.061	0.0067				0.969	0.042	0.1472
Age		0.0011	0.0036	Saliva Viral Load	0.0011, (-0.0036)	0.0027				0.0027	NP Viral Load	-0.009, (-0.019-0)			0.055
Viral Load Levels		0.0007	0.0034	Days from Symptom Onset	0.0007, (-0.0034)	0.0471				0.0471	Days from Symptom Onset	0, (-0.003-0.002)			0.791
HCW vs High	1.27 (0.54-2.1)	0.0006	0.003												
Low vs High	0.97 (0.3-1.64)	0.0046	0.430												
Med vs High	0.89 (0.13-1.64)	0.0212	0.589												
CD8 Tcm cells							0.979	0.003	0.0001				0.959	0.003	0.0558
Age		0.0735	0.0488	Saliva Viral Load	0.0735, (-0.0488)	0.0002				0.0002	NP Viral Load	-0.001, (-0.001-0)			0.017
Viral Load Levels		0.0004	<0.001	Days from Symptom Onset	0.0004, (-<0.001)	0.0002				0.0002	Days from Symptom Onset	0, (0-0)			0.486
HCW vs High	2.1 (1.16-3.5)	<0.001	1.73 (0.95-2.51)												
Low vs High	1.39 (0.51-2.26)	0.0019	0.46, (-0.28-1.2)												
Med vs High	0.81 (-0.17-1.78)	0.1050	0.935												
CD4 T cells							0.989	0.062	0.0271				0.984	0.048	0.0956
Age		0.0159	0.0077	Saliva Viral Load	0.0159, (-0.0077)	0.0133				0.0133	NP Viral Load	-0.012, (-0.024-0.001)			0.037
Viral Load Levels		0.0027	0.0004	Days from Symptom Onset	0.0027, (-0.0004)	0.022				0.022	Days from Symptom Onset	0, (-0.003-0.003)			0.893
HCW vs High	1.28 (0.61-1.95)	0.0002	1.07 (0.48-1.66)												
Low vs High	0.83 (0.21-1.44)	0.0087	0.05, (-0.5-0.61)												
Med vs High	0.33 (-0.37-1.3)	0.3525	0.9076												
CD4 Tcm cells							0.947	0.02	p<0.001				0.96	0.015	0.0091
Age		0.206	0.0769	Saliva Viral Load	0.206, (-0.0769)	0.0003				0.0003	NP Viral Load	-0.005, (-0.009-0.002)			0.002
Viral Load Levels		0.0009	0.0046	Days from Symptom Onset	0.0009, (-0.0046)	0.0003				0.0003	Days from Symptom Onset	0, (-0.001-0)			0.347
HCW vs High	1.6 (0.79-2.4)	<0.001	1.11, (0.41-1.81)												
Low vs High	1.25 (0.5-1.99)	0.0010	0.03, (-0.63-0.7)												
Med vs High	0.47 (-0.36-1.3)	0.2645	0.7142												
CD4 Th cells							0.969	0.005	0.0004				0.957	0.004	0.0174
Age		0.0558	0.0101	Saliva Viral Load	0.0558, (-0.0101)	0.0009				0.0009	NP Viral Load	-0.001, (-0.002-0)			0.005
Viral Load Levels		0.0094	0.0155	Days from Symptom Onset	0.0094, (-0.0155)	0.0009				0.0009	Days from Symptom Onset	0, (0-0)			0.423
HCW vs High	1.18 (0.45-1.92)	0.0016	0.88, (0.21-1.55)												
Low vs High	0.96 (0.28-1.63)	0.0052	0.03, (-0.6-0.66)												
Med vs High	0.33 (-0.42-1.9)	0.3864	0.7801												
CD4 TCRA cells							0.94	0.003	0.0219				0.981	0.001	0.0026
Age		0.1573	0.1958	Saliva Viral Load	0.1573, (-0.1958)	0.0077				0.0077	NP Viral Load	-0.001, (-0.001-0)			0.001
Viral Load Levels		0.0042	0.2048	Days from Symptom Onset	0.0042, (-0.2048)	0.1563				0.1563	Days from Symptom Onset	0, (0-0)			0.876
HCW vs High	0.49 (-0.16-1.14)	0.1408	0.35, (-0.21-0.91)												
Low vs High	1.7 (0.48-1.66)	0.0004	0.58, (0.05-1.11)												
Med vs High	0.72 (0.4-1.4)	0.0391	0.26, (-0.24-0.76)												
CD8 TCRA cells							0.923	0.005	0.0668				0.949	0.004	0.0672
Age		0.0178	0.0105	Saliva Viral Load	0.0178, (-0.0105)	0.0206				0.0206	NP Viral Load	-0.001, (-0.002-0)			0.043
Viral Load Levels		0.0011	0.0476	Days from Symptom Onset	0.0011, (-0.0476)	0.806				0.806	Days from Symptom Onset	0, (0-0)			0.632
HCW vs High	-0.6 (-0.84-0.71)	0.8770	-0.22, (-0.94-0.5)												
Low vs High	1.2 (0.31-1.73)	0.0047	0.72, (0.04-1.4)												
Med vs High	0.92 (0.12-1.72)	0.0235	0.03, (-0.61-0.67)												
Absolute Lymphocyte Counts							0.944	0.408	p<0.001				0.834	0.543	0.0216
				Saliva Viral Load	-0.19, (-0.269--0.112)	p<0.001				p<0.001	NP Viral Load	-0.061, (-0.136-0.013)			0.107
				Days from Symptom Onset	0.002, (-0.016-0.019)	0.863				0.863	Days from Symptom Onset	0.015, (-0.002-0.032)			0.089

** Log (x10⁶ cells/ml), * Standard cell counts (x10⁶ cells/ml)